Sandpoint User's Manual

6/9/99

Revision 1.01

Preliminary copy, subject to change without notice

1 OVERVIEW

1.1 REVISION HISTORY

Date	Revision	Distribution	Comments
2/21/99	1.0	General Release	For Sandpoint 1.0
6/9/99	1.01	General Release	Correction on jumper setting description on S5 and S6.

Please email your comments of this user's manual to:

RISC Hotline
Email: risc10@email.sps.mot.com

TRADEMARKS

1.2 INTRODUCTION

This document describes the features of the "Sandpoint" Processor PCI Mezzanine Card (PPMC) host board. This board contains one PMC/PPMC – compatible slot, four PCI slots and complement of standard PC motherboard logic such as an ISA bridge, serial, parallel, keyboard/mouse, floppy and IDE disk controllers. Sandpoint is intended for hardware and software development and evaluation purpose only, and is not intended for operation in commercial environments.

1.3 PURPOSE

The Sandpoint PPMC host board design has various uses including, but not limited to:

- System suitable to showcase the 8240 PMC, 7XX PMC and the other future PPMC solution
- System for use by customers in benchmarking, compatibility testing, firmware development etc.
- Software debug platform for embedded application.
- Development platform for use by third-parties firmware/utility developers.

It should be noted that Sandpoint is not intended only for purposes such as that outlined above and is not intended to be sold as a Motorola product.

1.3 REFERENCE DOCUMENTS

1.3.1 Motorola Documents

- PowerPC Microprocessor Family: The Programming Environments manual
- PowerPC 603e User's manual
- PowerPC 740 User's manual
- PowerPC 750 User's manual
- PowerPC 106 Chipset Implementation Definition
- PowerPC 8240 User's manual
- Sandpoint Hardware Reference Manual

1.3.2 External Documents

- Peripheral Component Interconnect (PCI) Specification Rev 2.1
- Draft Standard Physical and Environmental layers for PCI Mezzanine Cards: PMC (IEEE P1386.1/Draft 2.0 04-Apr-1995)
- Draft Standard Physical and Environmental Layers for Processor PCI Mezzanine Cards: PPMC (XXXX P1386.X/Draft 0.1 15-Feb-1998)
- Draft Standard for a Common Mezzanine Card Family: CMC (IEEE P1386/Draft 2.0 04-Apr-1995)
- ATX Specification version 1.0

2 PRODUCT SUMMARY

The Sandpoint motherboard is a "host" board, which accepts a PMC or PPMC card as well as up to four PCI slots. The host board has the following features:

PMC and PPMC support

- One PMC slot with PPMC, 64-bit and 66MHz extensions
- Switch-selectable operating modes
- Four PCI slots: 2 5V/32-bit slots, 2 3.3V/64-bit slots
- PCI slots support 33 or 66 MHz operation
- Two standard 16650-compatible ESD-protected serial ports
- IEEE 1284 parallel port
- Floppy disk port
- Two IDE ports
- PS/2 Mouse and keyboard connectors
- NVRAM and real-time clock (RTC)
- Advanced Power Controller ("soft on/off)
- LED monitors for critical functions
- Automatic sense of PCI bus speed (33 or 66 MHz)
- Flash EPROM for boot firmware
- ATX chassis with ATX power supply
- DINK32 Debug Monitor Software in ROM

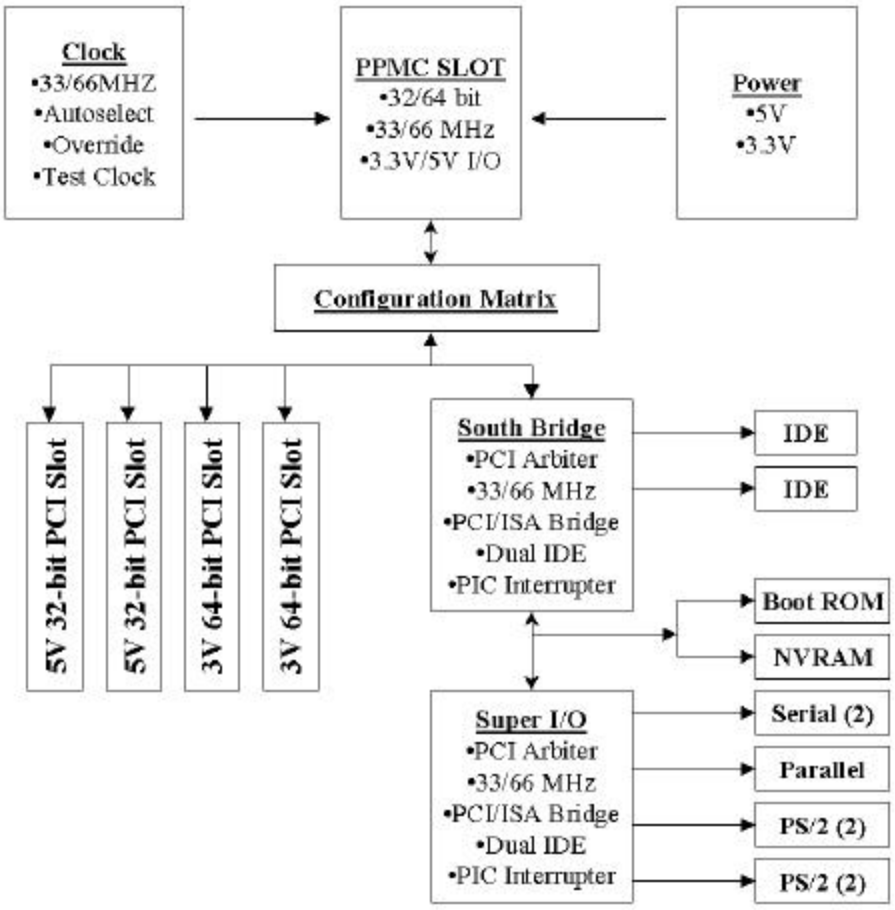
Notes: The I/O subsystem is identical to that of "EC"version of the Yellowknife development platform,

Current PowerPC evaluation system. When properly configured, software written for the Yellowknife platform should operate identically when executed on a Sandpoint.

3 SYSTEM CONFIGURATION

3.1 BLOCK DIAGRAM

The following is the block diagram of the Sandpoint:



4 CHASSIS

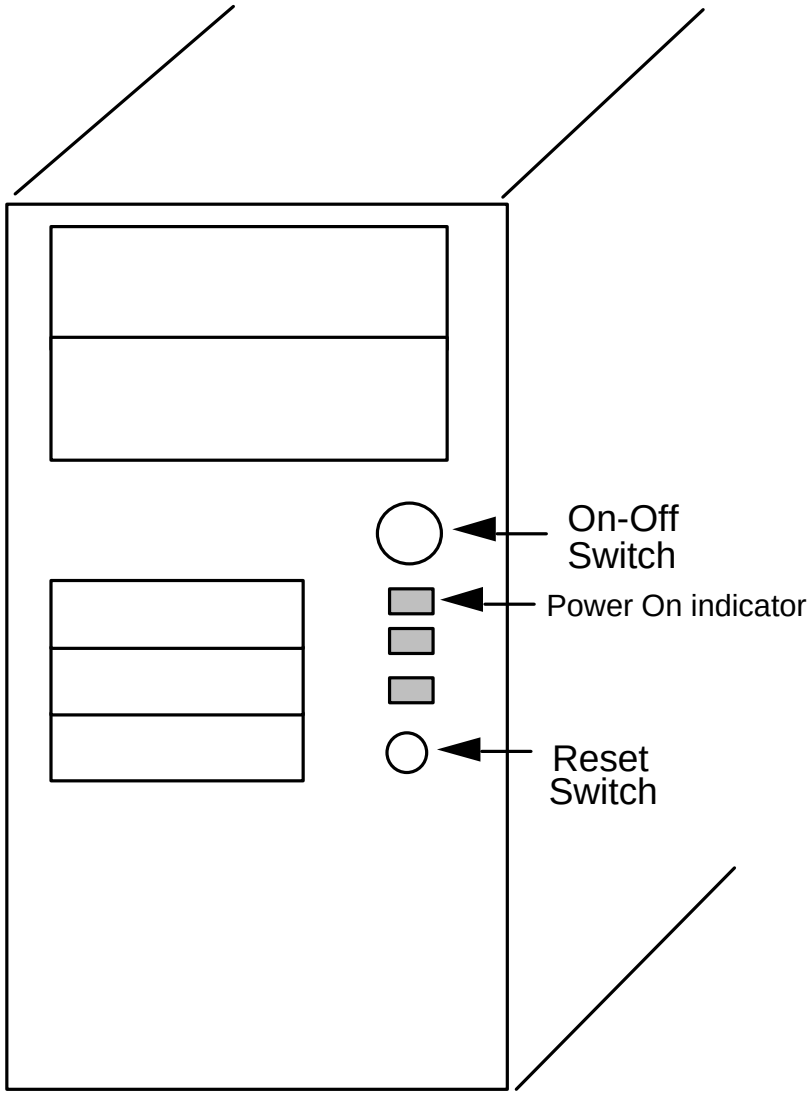
The Sandpoint use the ATX format chassis which had external drive bays for additional upgrade.

4.1 SLOTS

The Sandpoint chassis supports a total of four PCI slots for add-in cards. Two of the PCI slots are 32-bit and reminding two are 64-bit slots.

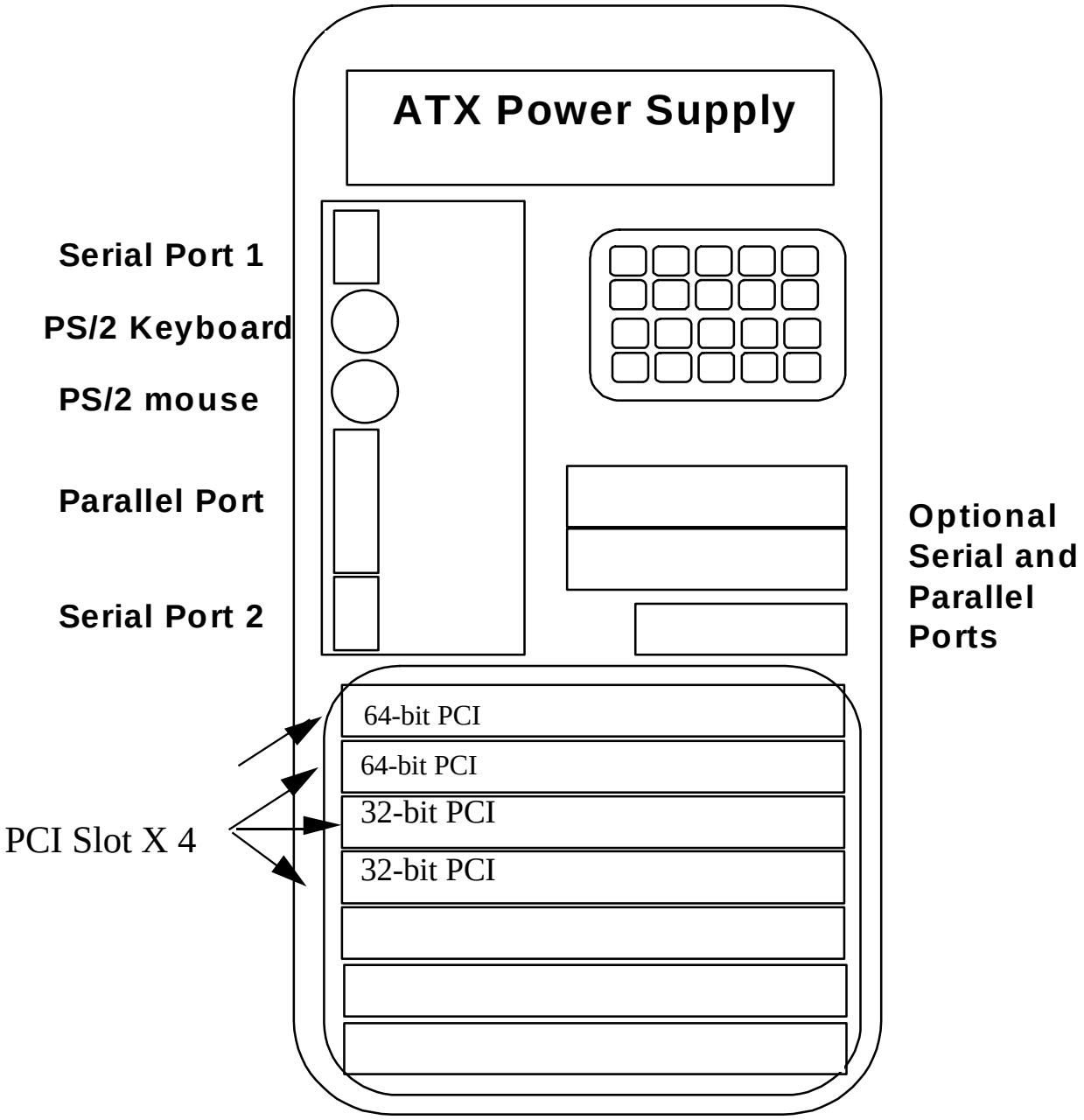
4.3 EXTERNAL CONTROLS & INDICATORS

The following diagram shows the front panel of the Sandpoint system:



4.4 EXTERNAL CONNECTORS

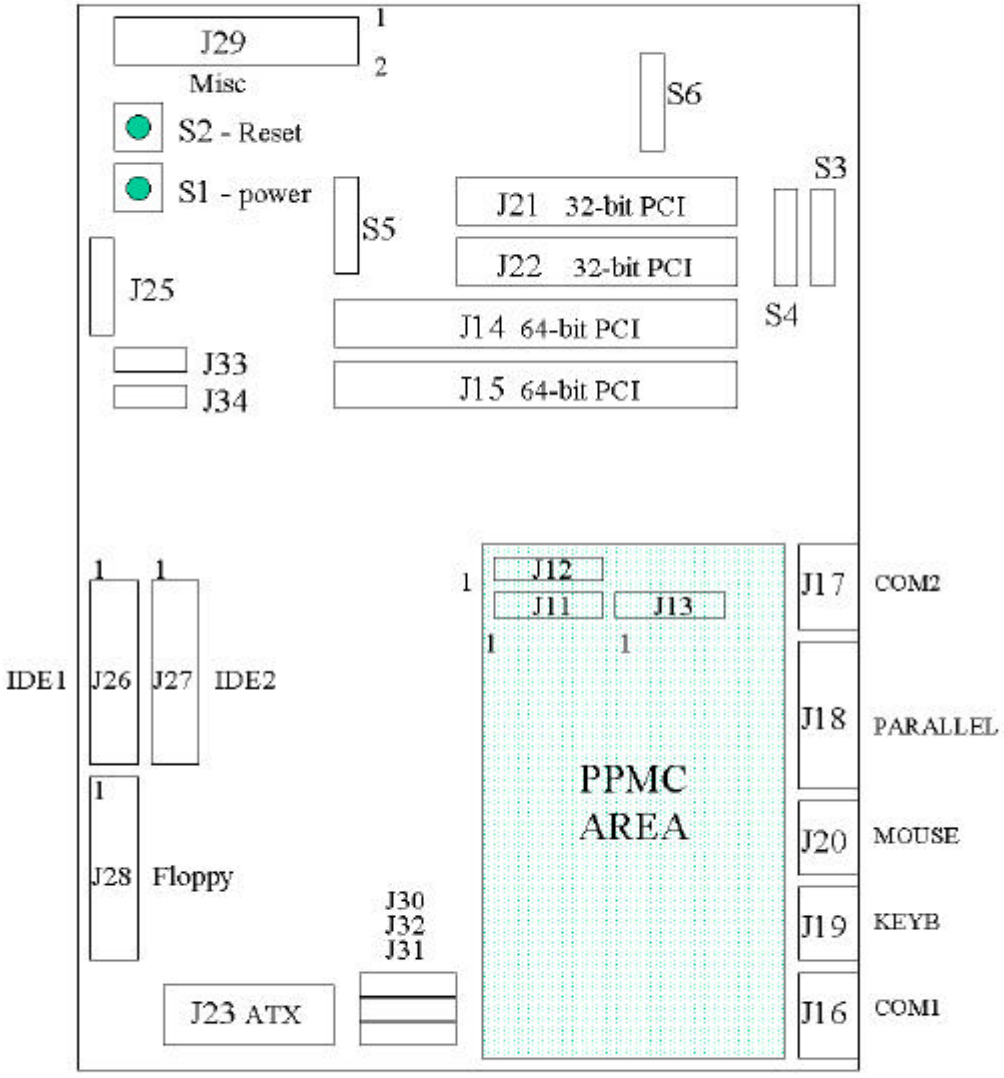
The following show the back panel on the ATX chassis:



5 INSTALLATION

5.1 MOTHERBOARD DIAGRAM

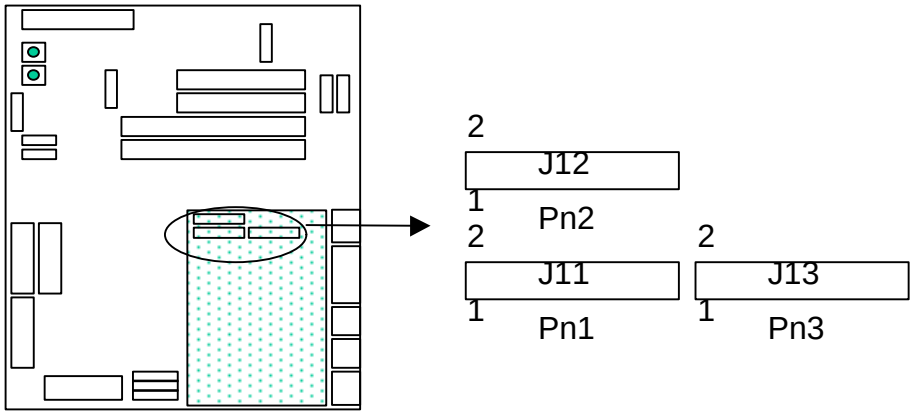
The following is the Sandpoint motherboard diagram:



5.2 JUMPERS AND CONNECTORS DESCRIPTION

1)	J11	PMC Connector 1 (64-pin)
2)	J12	PMC connector 2 (64-pin)
3)	J13	PMC connector 3 (64-pin)
4)	J14	64-bit PCI slot
5)	J15	64-bit PCI slot
6)	J16	COM1 port
7)	J18	Parallel Port
8)	J19	PS/2 Keyboard connector
9)	J20	PS/2 Mouse connector
10)	J21	32-bit PCI slot
11)	J22	32-bit PCI slot
12)	J23	ATX Connector
13)	J25	Battery connector
14)	J26	Primary IDE connector
15)	J27	Secondary IDE connector
16)	J28	Floppy Disk connector
17)	J29	Misc. connectors (Reset, PowerON, Speaker)
18)	J30,31,32	VIO selection jumpers
19)	J33	Test Clock Input
20)	J34	66MHz PCI Disable
21)	S1	Power On/Off Switch
22)	S2	Reset Switch
23)	S3,S4	Mode Selection Switch
24)	S5	Interrupt Inversion Switch
25)	S6	Shared Interrupt Selection Switch

5.2.1 J11, J12, J13 PPMC Connectors



Note: 8240 PMC uses only J11 and J12 connectors

Pn1/J11 32 Bit PCI pin description

Pin #	Signal Name	Signal Name	Pin #
1	TCK	-12V	2
3	Ground	INTA#	4
5	INTB#	INTC#	6
7	PRESENT#	+5V	8
9	INTD#	PCI-RSVD	10
11	Ground	PCI-RSVD	12
13	PCICLK	Ground	14
15	Ground	GNT#/XREQ[0]#	16
17	REQ#/XGNT[0]#	+5V	18
19	V(I/O)	AD[31]	20
21	AD[28]	AD[27]	22
23	AD[25]	Ground	24
25	Ground	C/BE[3]#	26
27	AD[22]	AD[21]	28
29	AD[19]	+5V	30
31	V(I/O)	AD[17]	32
33	FRAME#	Ground	34
35	Ground	IRDY#	36
37	DEVSEL#	+5V	38
39	Ground	LOCK#	40
41	SDONE#	SBO#	42
43	PAR	Ground	44
45	V(I/O)	AD[15]	46
47	AD[12]	AD[11]	48
49	AD[09]	+5V	50
51	Ground	C/BE[0]#	52
53	AD[06]	AD[05]	54
55	AD[04]	Ground	56
57	V(I/O)	AD[03]	58
59	AD[02]	AD[01]	60
61	AD[00]	+5V	62
63	Ground	REQ64#	64

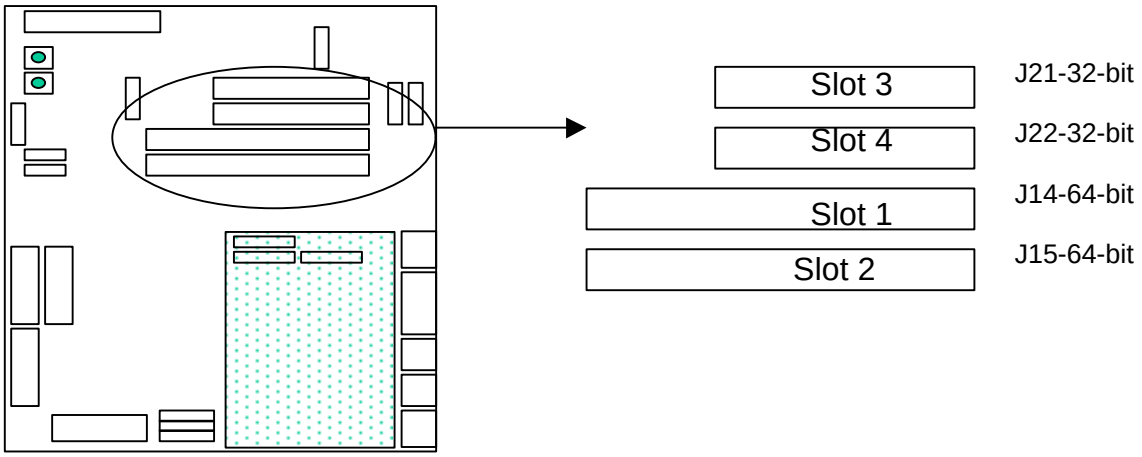
Pn2/J12 32Bit PCI Pin Description

Pin #	Signal Name	Signal Name	Pin #
1	+12V	TRST#	2
3	TMS	TDO	4
5	TDI	Ground	6
7	Ground	PCI-RSVD	8
9	PCI-RSVD	PCI-RSVD	10
11	XREQ[1]#	+3.3V	12
13	RST#	XREQ[2]#	14
15	+3.3V	XREQ[3]#	16
17	PCI-RSVD	Ground	18
19	AD[30]	AD[29]	20
21	Ground	AD[26]	22
23	AD[24]	+3.3V	24
25	IDSEL	AD[23]	26
27	+3.3V	AD[20]	28
29	AD[18]	Ground	30
31	AD[16]	C/BE[2]#	32
33	Ground	PMC-RSVD	34
35	TRDY#	+3.3V	36
37	Ground	STOP#	38
39	PERR#	Ground	40
41	+3.3V	SERR#	42
43	C/BE[1]#	Ground	44
45	AD[14]	AD[13]	46
47	M66EN	AD[10]	48
49	AD[08]	+3.3V	50
51	AD[07]	PMC-RSVD	52
53	+3.3V	PMC-RSVD	54
55	XGNT[1]#	Ground	56
57	XGNT[2]#	XGNT[3]#	58
59	Ground	PMC-RSVD	60
61	ACK64#	+3.3V	62
63	Ground	SYSCON#	64

Pn3/J13 64 Bit PCI Pin Description

Pin #	Signal Name	Signal Name	Pin #
1	PCI-RSVD	Ground	2
3	Ground	C/BE[7]#	4
5	C/BE[6]#	C/BE[5]#	6
7	C/BE[4]#	Ground	8
9	V(I/O)	PAR64	10
11	AD[63]	AD[62]	12
13	AD[61]	Ground	14
15	Ground	AD[60]	16
17	AD[59]	AD[58]	18
19	AD[57]	Ground	20
21	V(I/O)	AD[56]	22
23	AD[55]	AD[54]	24
25	AD[53]	Ground	26
27	Ground	AD[52]	28
29	AD[51]	AD[50]	30
31	AD[49]	Ground	32
33	Ground	AD[48]	34
35	AD[47]	AD[46]	36
37	AD[45]	Ground	38
39	V(I/O)	AD[44]	40
41	AD[43]	AD[42]	42
43	AD[41]	Ground	44
45	Ground	AD[40]	46
47	AD[39]	AD[38]	48
49	AD[37]	Ground	50
51	Ground	AD[36]	52
53	AD[35]	AD[34]	54
55	AD[33]	Ground	56
57	V(I/O)	AD[32]	58
59	PCI-RSVD	PCI-RSVD	60
61	PCI-RSVD	Ground	62
63	Ground	PCI-RSVD	64

5.2.2 J13, J14, J21 and J22 32-bit and 64-bit PCI Slot



Sandpoint has three PCI slots (PCI 1, PCI 2 and PCI 3). The connectors, pin assignments, signal timings, loadings and mechanical dimensions all conform to the standard PCI specification. The pin assignment for the PCI connectors is as follows:

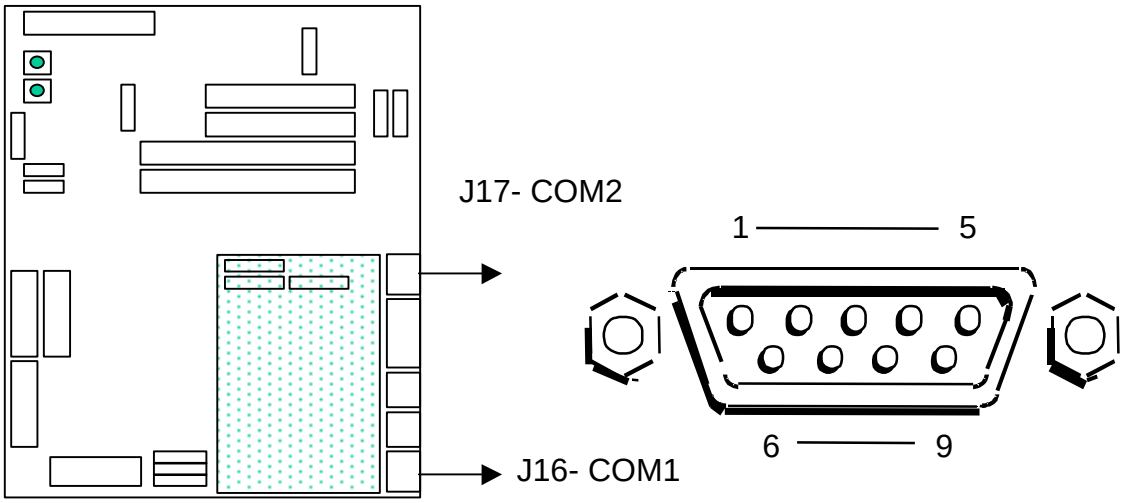
Pin	Description	Pin	Description	Comment
B1	-12V	A1	TRST*	32-bit connector starts
B2	TCK	A2	+12V	
B3	GROUND	A3	TMS	
B4	TD0	A4	TDI	
B5	+5V	A5	+5V	
B6	+5V	A6	INTA*	
B7	INTB*	A7	INTC*	
B8	INTD*	A8	+5V	
B9	PRSNT1*	A9	RESERVED	
B10	RESERVED	A10	+5V	
B11	PRSNT2*	A11	RESERVED	
B12	GROUND	A12	GROUND	
B13	GROUND	A13	GROUND	
B14	RESERVED	A14	RESERVED	
B15	GROUND	A15	RST*	
B16	CLK	A16	+5V (I/O)	
B17	GROUND	A17	GNT*	
B18	REQ*	A18	GROUND	
B19	+5V (I/O)	A19	RESERVED	
B20	AD31	A20	AD30	
B21	AD29	A21	+3.3V	
B22	GROUND	A22	AD28	
B23	AD27	A23	AD26	
B24	AD25	A24	GROUND	
B25	+3.3V	A25	AD24	
B26	C/BE*3	A26	IDSEL	
B27	AD23	A27	+3.3V	
B28	GROUND	A28	AD22	
B29	AD21	A29	AD20	
B30	AD19	A30	GROUND	
B31	+3.3V	A31	AD18	
B32	AD17	A32	AD16	
B33	C/BE*2	A33	+3.3V	
B34	GROUND	A34	FRAME*	
B35	IRDY*	A35	GROUND	
B36	+3.3V	A36	TRDY*	
B37	DEVSEL*	A37	GROUND	
B38	GROUND	A38	STOP*	
B39	LOCK*	A39	+3.3V	

B40	PERR*	A40	SDONE	32-bit connectors continued
B41	+3.3V	A41	SBO*	
B42	SERR*	A42	GROUND	
B43	+3.3V	A43	PAR	
B44	C/BE*1	A44	AD15	
B45	AD14	A45	+3.3V	
B46	GROUND	A46	AD13	
B47	AD12	A47	AD11	
B48	AD10	A48	GROUND	
B49	GROUND	A49	AD9	
B50	(KEY)	A50	(KEY)	
B51	(KEY)	A51	(KEY)	
B52	AD8	A52	C/BE*0	
B53	AD7	A53	+3.3V	
B54	+3.3V	A54	AD6	
B55	AD5	A55	AD4	
B56	AD3	A56	GROUND	
B57	GROUND	A57	AD2	
B58	AD1	A58	AD0	
B59	+5V (I/O)	A59	+5V (I/O)	
B60	ACK64*	A60	REQ64*	
B61	+5V	A61	+5V	
B62	+5V	A62	+5V	
	Connector Key			64-bit spacer
B63	RESERVED	A63	GROUND	64-bit connector start
B64	GROUND	A64	C/BE[7]#	
B65	C/BE[6]#	A65	C/BE[5]#	
B66	C/BE[4]#	A66	+3.3V	
B67	GROUND	A67	PAR64	
B68	AD[63]	A68	AD[62]	
B69	AD[61]	A69	GROUND	
B70	+3.3V	A70	AD[60]	
B71	AD[59]	A71	AD[58]	
B72	AD[57]	A72	GROUND	
B73	GROUND	A73	AD[56]	
B74	AD[55]	A74	AD[54]	
B75	AD[53]	A75	+3.3V	
B76	GROUND	A76	AD[52]	
B77	AD[51]	A77	AD[50]	
B78	AD[49]	A78	GROUND	
B79	+3.3V	A79	AD[48]	
B80	AD[47]	A80	AD[46]	
B81	AD[45]	A81	GROUND	
B82	GROUND	A82	AD[44]	
B83	AD[43]	A83	AD[42]	
B84	AD[41]	A84	+3.3V	
B85	GROUND	A85	AD[40]	
B86	AD[39]	A86	AD[38]	
B87	AD[37]	A87	GROUND	
B88	+3.3V	A88	AD[36]	
B89	AD[35]	A89	AD[34]	
B90	AD[33]	A90	GROUND	
B91	GROUND	A91	AD[32]	
B92	RESERVED	A92	RESERVED	
B93	RESERVED	A93	GROUND	
B94	GROUND	A94	RESERVED	64-bit connector end

5.2.3 J16, J17 COM Ports

Sandpoint has two 16550-compatible serial ports. PC serial connectors are located at the back panel.

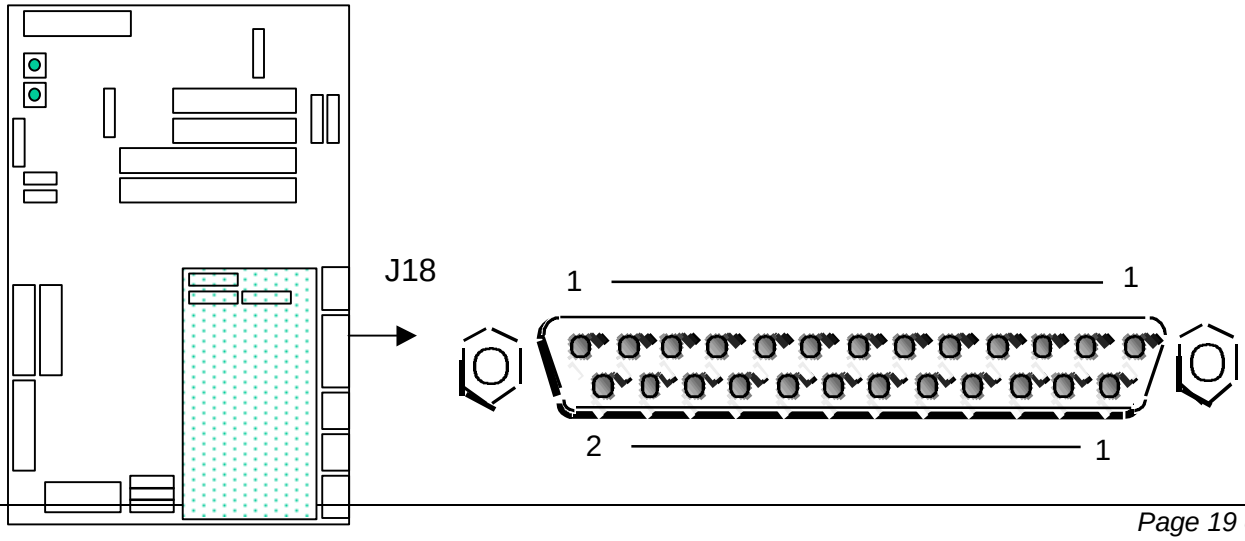
PC serial port pin assignment



Pin	Signal	I/O	Definition
1	DCD	I	Data carrier detect
2	SIN	I	Serial input
3	SOUT	O	Serial output
4	DTR	O	Data terminal ready
5	GND	N/A	Signal GND
6	DSR	I	Data Set Ready
7	RTS	O	Request To Send
8	CTS	I	Clear To Send
9	RI	I	Ring Indicator

5.2.4 J18 Parallel Port

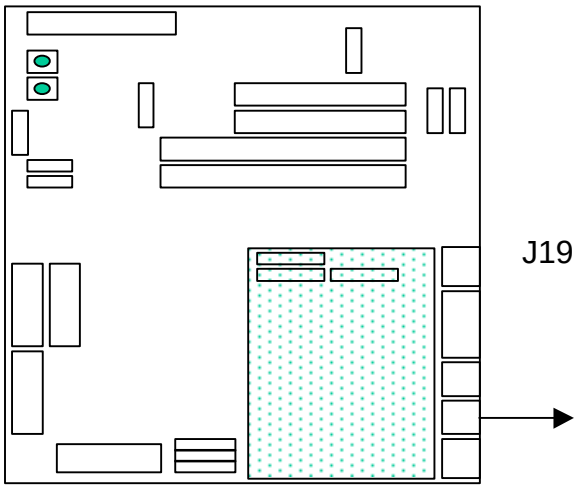
Sandpoint has one AT-compatible, bi-directional parallel port. This connector is located at the back panel.



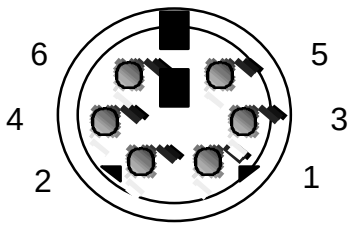
Pin	Signal	I/O	Definition
1	STB#	I/O	Strobe
2	PD0	I/O	Printer data bit o
3	PD1	I/O	Printer data bit 1
4	PD2	I/O	Printer data bit 2
5	PD3	I/O	Printer data bit 3
6	PD4	I/O	Printer data bit 4
7	PD5	I/O	Printer data bit 5
8	PD6	I/O	Printer data bit 6
9	PD7	I/O	Printer data bit 7
10	ACK#	I	Acknowledge
11	BUSY	I	Busy
12	PE	I	Paper end
13	SLCT	I	Select
14	AFD#	O	Automatic Feed
15	ERR#	I	Error
16	INIT#	O	Initialize printer
17	SLIN#	O	Select in
18-25	GND	N/A	Signal GND

5.2.5 J19,J20 PS/2 Keyboard and Mouse Connector

Sandpoint supports both the AT-compatible keyboard interfaces. PS/2 keyboard connectors are located at the back panel.



J19 PS/2 Keyboard

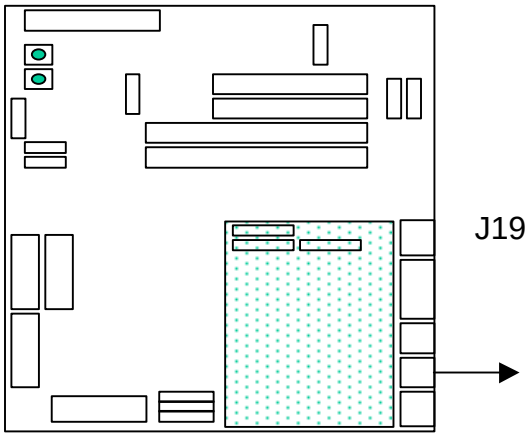


The following is the PS/2 Keyboard pin definition:

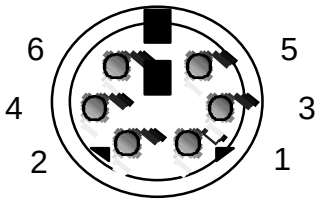
Pin	Signal	I/O	Definition
1	KBDATA	I/O	Keyboard data
2	NC	N/A	No connection
3	GND	N/A	Signal GND
4	FVcc	N/A	Fused supply voltage
5	KBCLK	I/O	Keyboard clock
6	NC	N/A	No connection

Shell	N/A	N/A	Chassis GND

Sandpoint supports both the PS/2 compatible mouse The PS/2 mouse is supported through the mouse port. PS/2 mouse connector is located at the back panel.
PS/2 mouse connector pin assignment



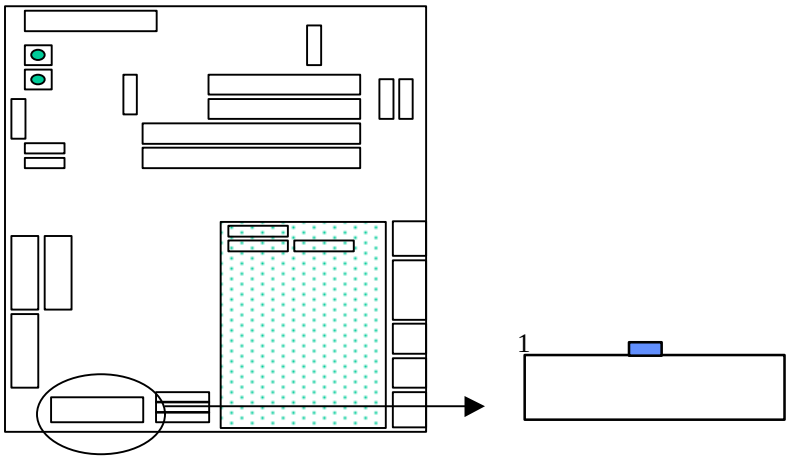
J19 PS/2 Mouse



Pin	Signal	I/O	Definition
1	MFDATA	I/O	Mouse data
2	NC	N/A	No connection
3	GND	N/A	Signal GND
4	FVcc	N/A	Fused supply voltage
5	KBCLK	I/O	Mouse clock
6	NC	N/A	No connection
Shell	N/A	N/A	Chassis GND

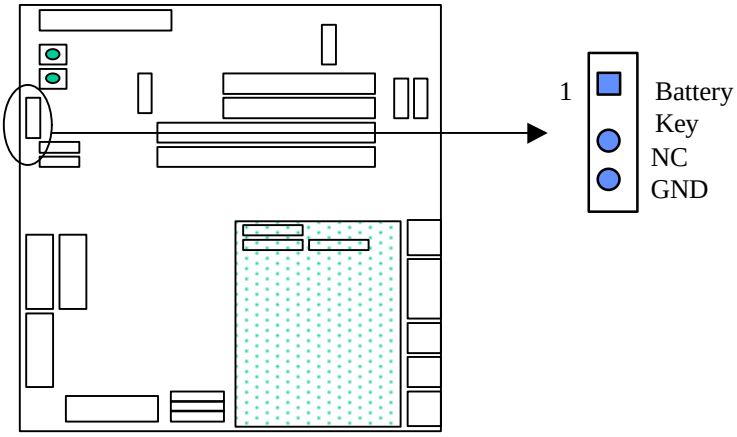
5.2.6 J23 ATX Power Connector

Sandpoint uses the standard ATX power supply, which provide the 5V and 3.3V to the motherboard. The following is the power connector pin assignment:



Pin	Signal	Pin	Signal
1	+3.3V	11	+3.3V
2	+3.3V	12	-12V
3	GND	13	GND
4	VCC	14	PS_ON
5	GND	15	GND
6	VCC	16	GND
7	GND	17	GND
8	PWRGOOD	18	-5V
9	VSTDBY	19	VCC
10	+12V	20	VCC

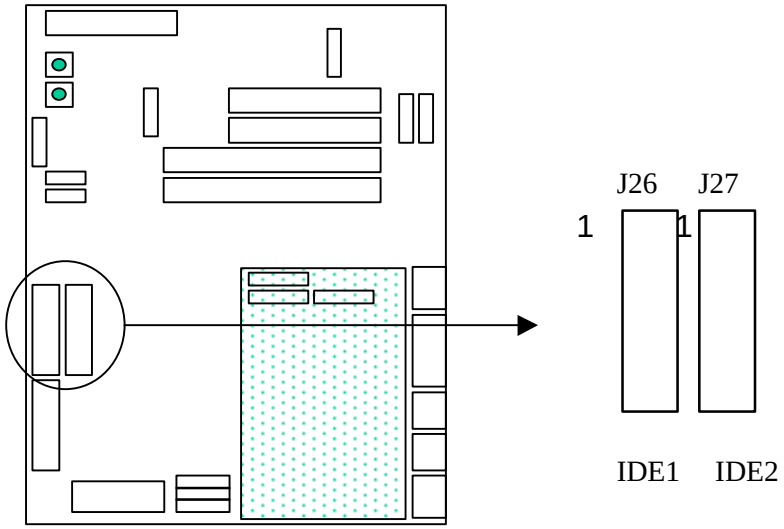
5.2.7 J25 CMOS Battery Connector



Connect the CMOS battery connector to either 1-4

5.2.8 J26, J27 IDE Connectors

The Enhanced IDE controller is built in the PCI-ISA bridge, two IDE connectors are on the motherboard to support both the enhanced IDE hard drives and the IDE CD-ROM. The IDE controller is part of the Winbond 553. See the Winbond 553 data book for additional information on the IDE controller.

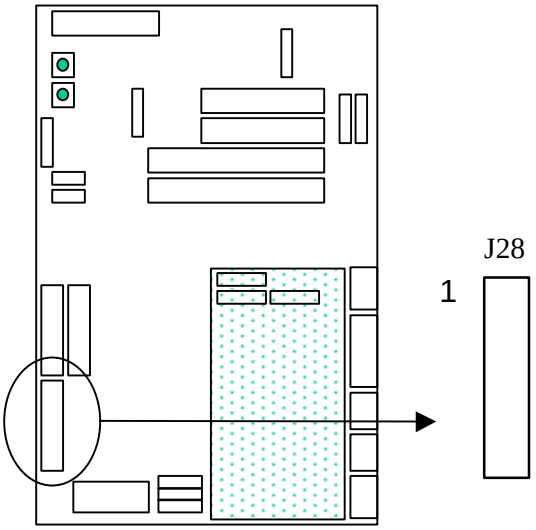


IDE connector pin assignment

Pin	Signal	Pin	Signal
1	IDERESET#	2	GND
3	IDED7	4	IDED8
5	IDED6	6	IDED9
7	IDED5	8	IDED10
9	IDED4	10	IDED11
11	IDED3	12	IDED12
13	IDED2	14	IDED13
15	IDED1	16	IDED14
17	IDED0	18	IDED15
19	GROUND	20	N.C.
21	IDEDRQ#	22	GND
23	IDEIOW#	24	GND
25	IDEIOR#	26	GND
27	N/C	28	IDEBALE
29	IDEACK#	30	GND
31	IDEIRQ	32	IDEIOCS16#
33	IDESA1	34	N.C.
35	IDESA0	36	IDESA2
37	IDECS0#	38	IDECS1#
39	DISKLED#	40	GND

5.2.9 J28 Floppy Disk Connector

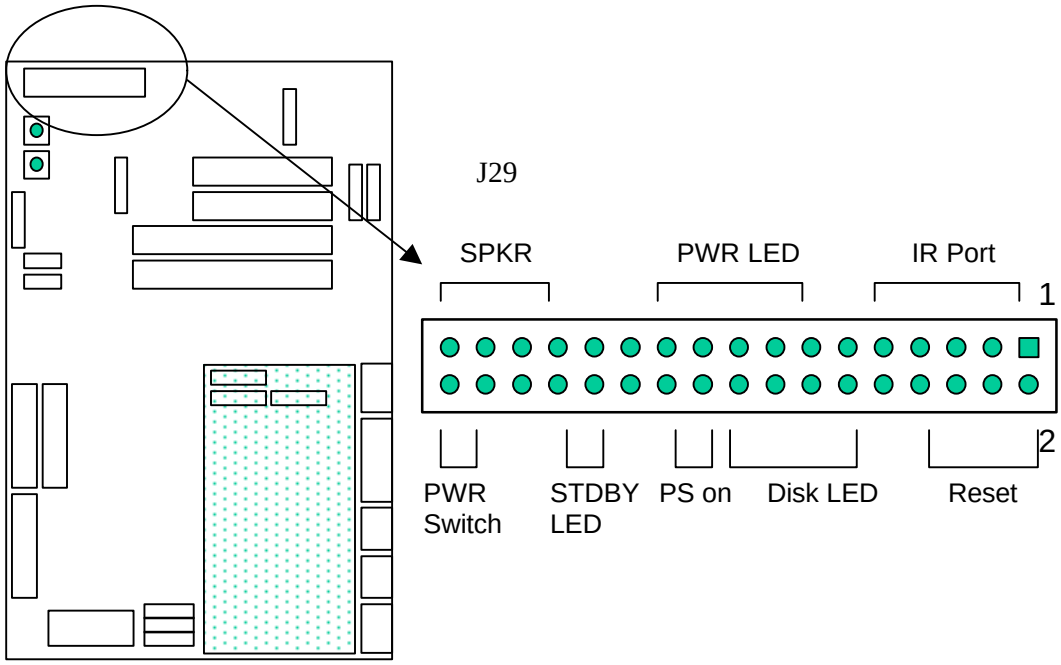
Sandpoint incorporates a 34-pin Floppy disk connector to support the floppy disk drive. The floppy controller is in the National 308 Super I/O chip. See National 308 data book for additional information.



The pin assignment of the PC standard floppy disk drive is as follows:

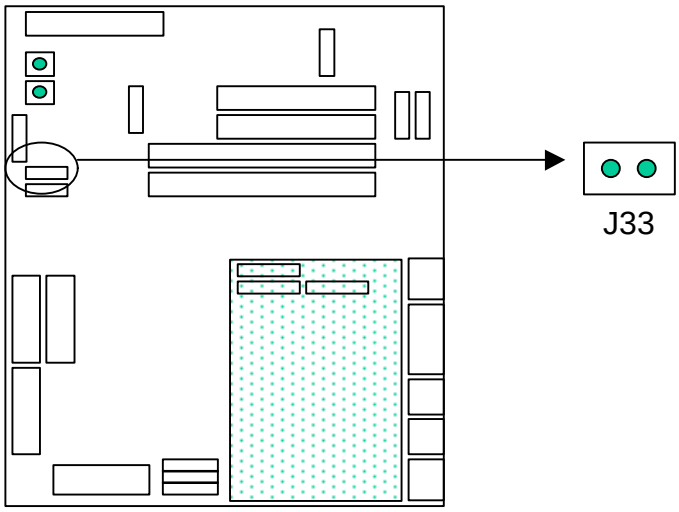
Pin	Signal	Pin	Signal
1	Gnd	2	DENSEL
3	Gnd	4	NC
5	Gnd	6	NC
7	NC	8	INDEX#
9	Gnd	10	MTR0#
11	Gnd	12	DRVSEL1#
13	Gnd	14	DRVSEL0#
15	Gnd	16	MTR1#
17	MSEN1	18	DIR#
19	Gnd	20	STEP#
21	Gnd	22	WDATA#
23	Gnd	24	WGATE#
25	Gnd	26	TRK0#
27	MSEN0	28	WRTPRT#
29	Gnd	30	RDATA#
31	Gnd	32	HDSEL#
33	Gnd	34	DSKCHG#

5.2.10 J29 Misc. Connectors



Pin	Signal	Pin	Signal
1	VCC	2	GND
3	NC	4	RSTHDR#
5	IRRX	6	GND
7	GND	8	NC
9	IRTX	10	NC
11	NC	12	VCC
13	VCC	14	DISKLED#
15	NC	16	DISKLED#
17	GND	18	VCC
19	NC	20	PS_ON#
21	GND	22	GND
23	NC	24	NC
25	NC	26	VSTDBY
27	PCSPKR	28	GND
29	NC	30	NC
31	GND	32	PWR_A
33	VCC	34	PWR_B

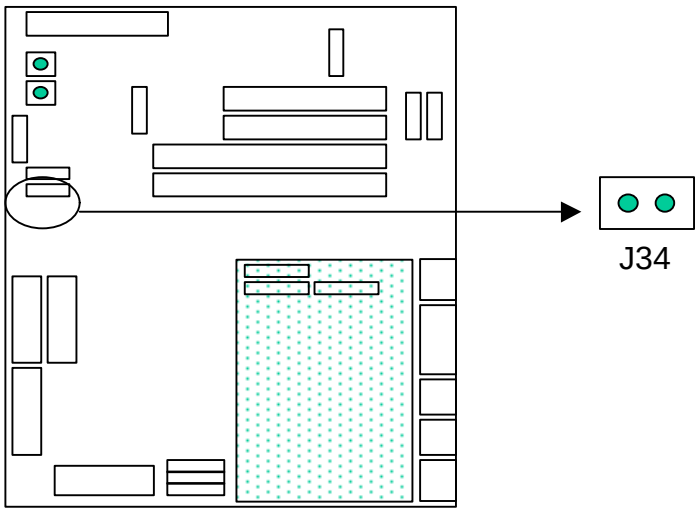
5.2.11 J33 Test Clock Input



If jumper J33 is installed, the on-board 66MHz oscillator is disabled and an external clock source is used to drive the PCI bus. The signal provided must be 3.3V LVTTL logic levels into a 50 ohms Load. The input clock is supplied as-is, or divided by two, depending upon the state of the M66EN (66MHz PCI) status and the 66MHz PCI Disable jumper.

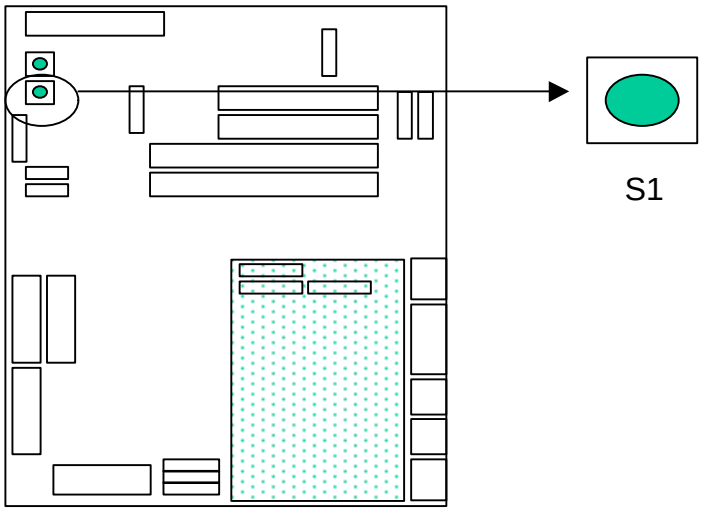
Care must be used that the devices receiving the clock are capable of and are configured to operate at the new clock speed. In particular, PowerPC devices have internal PLLs, which require a minimum clock input to operate properly.

5.2.12 J34 66MHZ PCI Disable



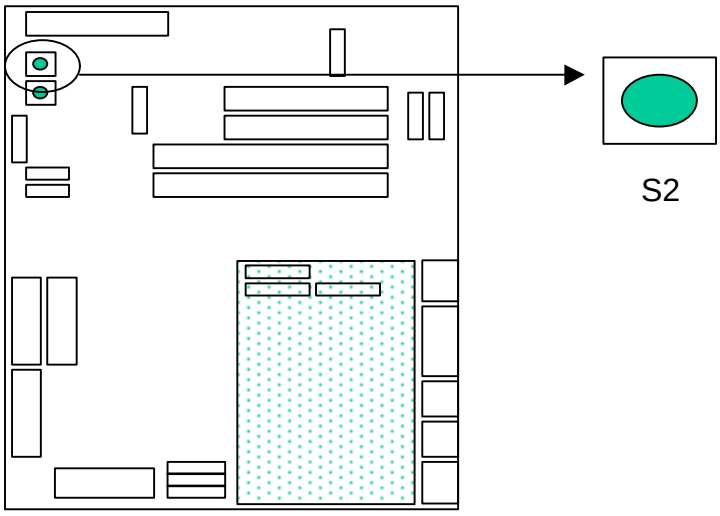
If jumper 34 is installed, the PCI bus will operate at 33MHz regardless of the status of the M66EN signal. The PCI bus ordinarily selects 66 MHz operation if (and only if) all PPMC and PCI devices installed support 66 MHz clock rates; otherwise, the slower 33MHz rate is used. However, for testing purposes, this jumper may be used to evaluate slower bus clock rates. In addition, it may be needed for systems using 66MHz-capable cards which also wish to use the Winbond or on-board I/O. Since these devices operate at 33MHz only, yet do not have an M66EN pin to control clock selection, jumper J34 is required to force the PCI bus to operate at 33MHz.

5.2.13 S1 Power ON/OFF Switch



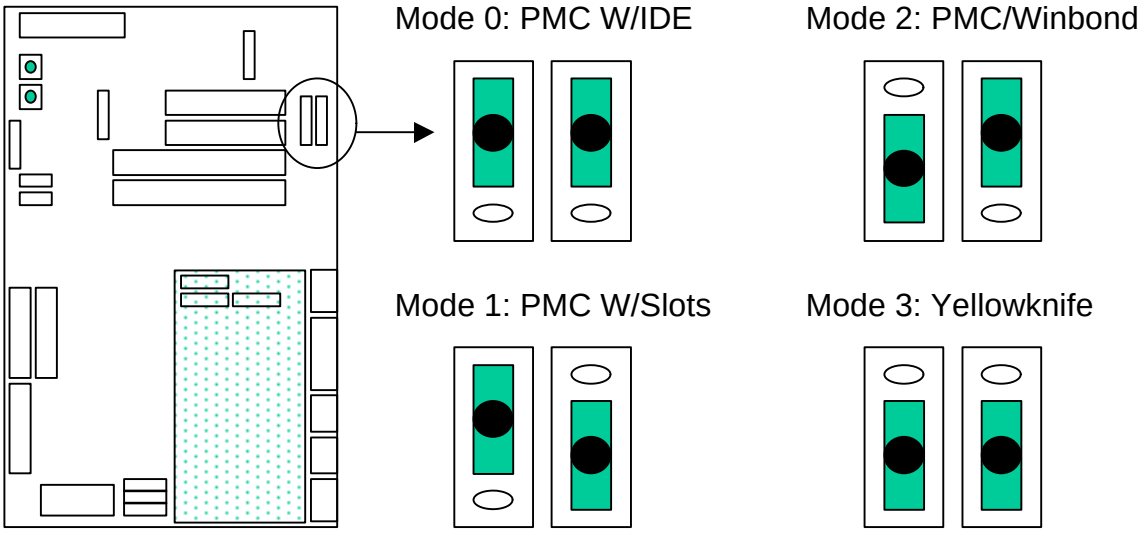
Press once to power up the system. Press again to power off the system.
SEE ERRATA

5.2.14 S2 Reset Switch



Press once to reset the system

5.2.15 S3, S4 Mode Selection Switch



To support existing Yellowknife/PPMC software environment, as well as the new Sandpoint/PPMC environment, Sandpoint supports four different modes, which are selectable via a pair of switches. The following table describes the modes.

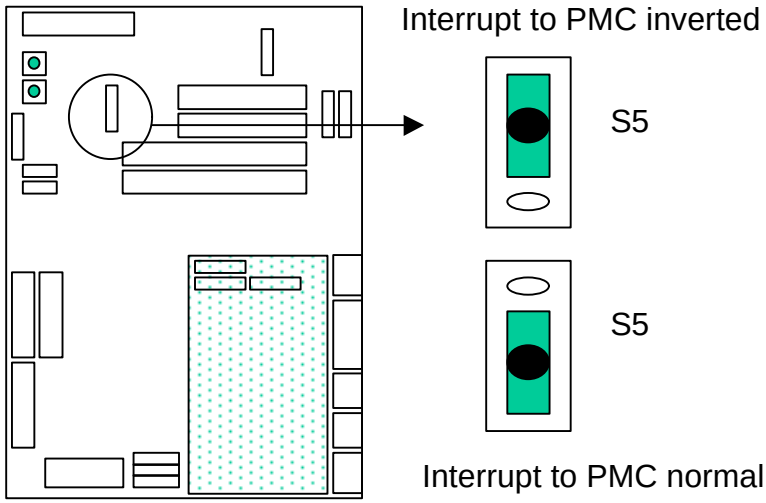
Mode		Name	Description
Default	0	PPMC Host With IDE	**PPMC Host Mode W/IDE support**: The PPMC slot is the system controller and provides arbitration and interrupt control. The Winbond IDE disk controllers replace slots 1 and 2 (3.3V PCI slots). The 5V PCI slots 3 and 4 are available. The on-board I/O shares interrupts with slots 2 or 3
	1	PPMC Host with Slots	**PPMC Host Mode W/Four slot support**: The PPMC slot is the system controller and provides arbitration and interrupt control. The Winbond IDE disk controllers are unavailable. All slots are available. The on-board I/O shares interrupts with slots 2 or 3
	2	PPMC/Winbond	**PPMC/Winbond Mode**: The PMC slot is an agent, and the Winbond provides arbitration and interrupt control. The Winbond interrupt output drives the INTA# pin of the PPMC slot.
	3	Yellowknife	**Yellowknife Mode**: The PPMC slot is an agent, and the Winbond provides arbitration and interrupt control. The Winbond interrupt output drives the INTA# pin of the forth PCI slot.

Which mode should be selected? The first two modes are the principal modes, which will be used for new development, and can be selected between by deciding whether four PCI slots are needed or IDE is needed.

The Latter two modes are intended as transitional settings, and may be used to aid conversion from a modified Yellowknife platform, where a PPMC is connected through a PMC->PCI adapter card. This Yellowknife system is identical to a Sandpoint operating in mode 3. Mode 2 is architecturally similar except that the adapter card may be eliminated. Mode 2 is also useful for early PPMC cards such as the PPMC750, which do not include a PCI arbiter, since the Winbond provides this feature.

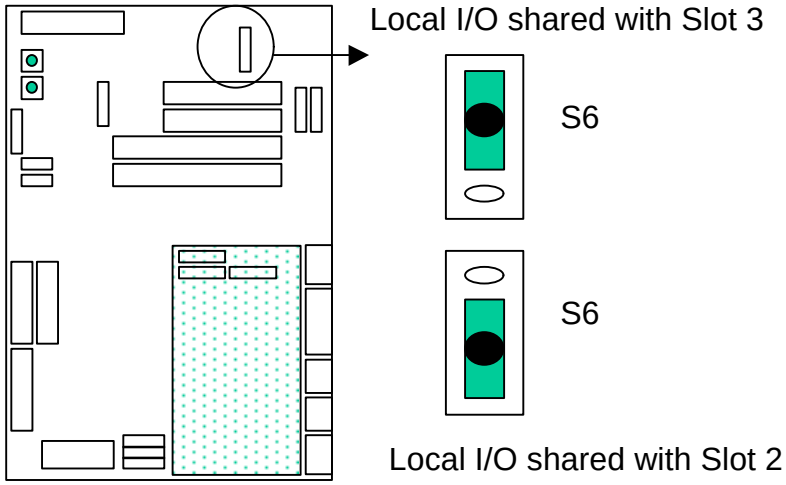
The Sandpoint board uses switches to select one of the four configuration choices. Logic on the Sandpoint host board switches the connections of the PCI request/grant signals, the PCI interrupt signals, and the component configuration mode (SYSCON#, ARBDIS#, etc) to provide the required environment. Appendix A shows how the different signals on the motherboard are interconnected.

5.2.16 S5 Interrupt Inversion Switch



Some PPMC cards, such as the PPMC8240, are configured with active-high interrupt input when operated in the default configuration, which conflicts with PCI requirements. This is one example in which the MPC8240 is not quite identical to an MPC603+MPC106, so software moved as-is from the Yellowknife to the PPMC8240 will find interrupts are not working. The short term work-around is to configure Sandpoint to invert the PMC interrupt signal; since this violates the specs, it is intended only for a short term assistance; the correct solution is to program the EPIC of the MPC8240 to accept the correct polarity.

5.2.17 S6 Shared interrupt Selection Switch



PPMC cards support up to four interrupt sources. When operating in modes 0 or 1, there are a total of five possible interrupt sources (four slots and the winbond PIC (handling the local I/O resources such as serial ports)). When on-board I/O is needed, it must be shared with or replace PCI devices in slot 2 or slot 3. Software must poll multiple sources to determine the interrupt source if both the slot and local I/O are needed; otherwise, the slot can be left unused or used with non-interrupting devices such as graphics cards.

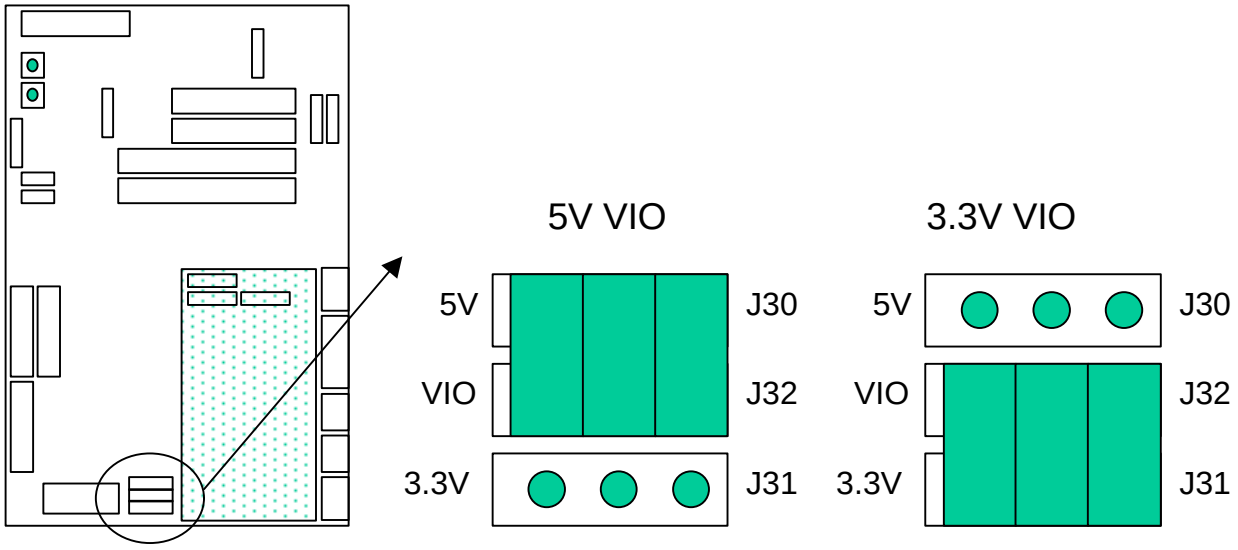
To select which slot replaces/shares interrupts with the Sandpoint local I/O, set the switch as shown above. This switch setting is ignored when the board is configured in modes 2 or 3.

5.2.18 J30, J31 and J32 VIO Selection

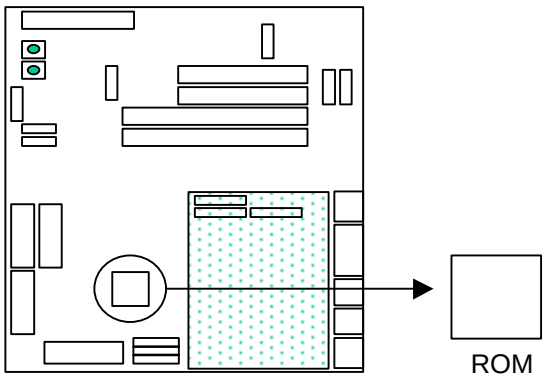
Jumpers J30, J31 and J32 are used to set the I/O voltage signaling level for the PPMC card. As with PCI slots, the PPMC slot provides the ability to provide I/O power on certain pins, and compatibility is maintained using keying methods (for PCI slots, a key is present in the slot, while for PPMC slots, a keying pin protrudes from the motherboard into the PPMC card). For flexibility in testing purposes, Sandpoint allows any types of VIO-Keyed board to be installed, with the proper VIO selected by jumper J30-J32.

NOTE: This flexibility requires that the Sandpoint be configured to match the PPMC card before powering up.

NOTE: All three jumpers must be set in an identical fashion; if any are different, the power supply will short and the board can be damaged or destroyed.



5.3 BOOT ROM



Sandpoint incorporates a boot ROM which is implemented as a 4Mb (512Kbx8) flash EPROM. The BootROM contains the DINK32 boot code to support basic debug function. See the DINK32 user's manual for more information.

The boot ROM is physically located on the ISA bus.

5.4 RTC AND NVRAM

Sandpoint incorporates an 8 KB battery-backed SRAM, which is organized as 8Kbx8 and is used for the storage of system configuration information such as:

- Passwords
- Boot record
- Global environment parameters
- Language data

5.5 DISPLAY

Sandpoint communicate with the terminal through serial port 1, the terminal needs to be VT-100 compatible.

5.6 IDE DRIVE (S)

Sandpoint includes logic for a PCI bus Master IDE Interface. Two connectors are located on the motherboard to support the primary and secondary interface.

5.7 HARD DRIVE ACTIVITY INDICATOR

The Sandpoint chassis incorporates a hard disk drive activity indicator that is ON when data is being transferred to/from any internal IDE drive.

5.8 FLOPPY DRIVE(S)

Sandpoint supports 3.5" standard PC floppy disk drive.

5.9 SPEAKER

A PC-type 2.5"--diameter speaker is mounted on the inside of the chassis.

5.10 POWER SUPPLY

Sandpoint incorporates a ATX format 250W PC-type power supply capable of supplying sufficient power at all required voltages to meet the needs of the supported motherboard, drives and add-in cards.

The power supply is switchable externally between 100V/60Hz and 220V/50Hz operations.

6 KEY COMPONENTS

The following table summarizes the key components used in the Sandpoint system:

PCI-ISA Bridge	Winbond 83C553
I/O Controller	National Semi PC87308VUL
Enhanced IDE controller	Built in the Winbond 83C553
NVRAM (RTC)	Built in PC87308VUL

6.1 WINBOND 83C553

The Sandpoint system uses the Winbond 83C553 PCI-ISA controller as a bridge to the ISA bus. This bridge provides the following functions:

- 100% PCI and ISA compatible
- Incorporates two 8237 DMA controllers
- High performance PCI arbiter
- Incorporates two 8259 interrupt controllers
- One 82C54 16-bit counter/timer
- Bus master IDE support for 4 IDE devices

For more information on the Winbond chip, please refer to their user's manual.

6.2 NATIONAL SEMICONDUCTOR PC87308

The PC87308 is a single chip super I/O controller. It incorporates in one fully Plug and Play compatible chip, a Floppy Disk controller, a Keyboard and mouse controller, a Real-time clock. two full function UARTs, infrared support, a full IEEE 1284 parallel port, three general purpose chip select signals, and support for power management functions.
PC87308 also provide interface to the external SRAMs to provide the NVRAM functions.

7 DINK32 DEBUG MONITOR

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Sandpoint is shipped with DINK32 boot firmware. DINK32 is a flexible software tool enabling evaluation and debugging of the PowerPC 32-bit microprocessor. DINK32 is designed to be both a hardware and software-debugging tool. DINK32 was written in ANSI C and built with modular routines around a central core. Only a few necessary functions were written in PowerPC assembly.

The DINK32 provides the following functions:

- Modification and display of general purpose, floating point, and special purpose registers
- Assembly and disassembly of PowerPC instructions for modification and display of code
- Single-step race and continued execution from a specified address
- Modification, display, and movement of system memory
- Setting, displaying and removing breakpoints
- Automatic decompression of compressed s-record files while downloading
- Extensive on-line help
- Ability to execute user-assembled and/or download software in a controlled environment
- Logging function for generating a transcript of a debugging session
- Two command sets for novice and experienced users

Please refer to http://www.mot.com/SPS/PowerPC/teksupport/tools/DINK32/index.html for more information.

8 INTERRUPT CONFIGURATION

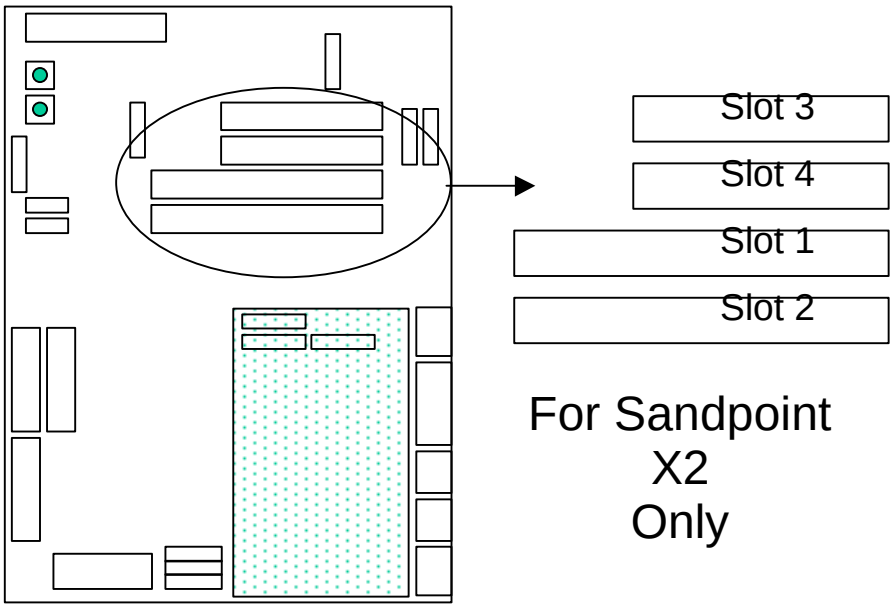
The following table descirbes the interrupt sources seen by the PMC when the Sandpoint has been configured for mode 0. This is the default configuration, and assumes that the on-board I/O interrupt is shared with slot 1 (also the default)

PMC Interrupt Line (INT(0-3))				**Description**
0	**1**	**2**	**3**	
Slot 1 **INTA#**	Slot 2 **INTA#**	Slot3 **INTA#**	Slot 4 **INTA#**	Each slot's primary interrupt output (INTA) is routed to a corresponding interrupt input on the PMC card.
Slot 2 **INTB#**	Slot 3 **INTB#**	Slot 4 **INTB#**	Slot 1 **INTB#**	
Slot 3 **INTC#**	Slot 4 **INTC#**	Slot 1 **INTC#**	Slot 2 **INTC#**	
Slot 4 **INTD#**	Slot 1 **INTD#**	Slot 2 **INTD#**	Slot 3 **INTD#**	
	SIOINT#			On-board I/O interrupts are shared with "slot 2" by default

9 PCI SLOT INFORMATION

The following table describes the PCI slot information of the Sandpoint host board. This information is constant for any mode selected.

PCI Slot/ Device	Physical Location	Configuration IDSEL	Configuration Address	Note
Winbond	N/A	AD11	0x8000_08XX	
1	Second-nearest PMC	AD13	0x8000_20XX	**Slot 1 and 2 are mis-labeled on Sandpoint X2 version; the actual ordering is 2-1-4-3 (from the PMC outward)**
2	Nearest PMC	AD14	0x8000_40XX	
3	Third-from PMC	AD15	0x8000_80XX	
4	Furthest from PMC	AD16	0x8001_00XX	



APPENDIX A: INTERCONNECTION DIAGRAM